

CLAIMS

1. A semiconductor laser in which an n-type semiconductor layer, an active layer, and a p-type semiconductor layer are stacked in this order on a
5 substrate;

the active layer comprising a well layer composed of InGaN;

the semiconductor laser comprising an intermediate layer sandwiched between the active layer and the p-type
10 semiconductor layer; and the intermediate layer including no intentionally added impurities and being composed of a gallium nitride-based compound semiconductor.

2. A semiconductor laser according to claim 1,
wherein the thickness of the intermediate layer is not
15 less than 15 nm and not more than 180 nm.

3. A semiconductor laser according to claim 2,
wherein the semiconductor laser is a Group III-V nitride
semiconductor laser, the n-type semiconductor layer
contains Si as an n-type impurity, and the p-type
20 semiconductor layer contains Mg as a p-type impurity.

4. A semiconductor laser according to claim 1,
wherein the concentration of the p-type impurity in the
active layer is about $1E17 \text{ cm}^{-3}$ or lower.

5. A process for manufacturing a semiconductor
25 laser, comprising the steps of:

forming on a substrate an n-type semiconductor layer doped with an n-type impurity;

forming on the n-type semiconductor layer an active layer comprising a well layer composed of InGaN;

5 forming on the active layer an intermediate layer composed of a gallium nitride-based compound; and

forming on the intermediate layer a p-type semiconductor layer doped with a p-type impurity, wherein the intermediate layer is formed without being 10 doped with any impurities.

6. A semiconductor laser in which an n-type semiconductor layer, an active layer, and a p-type semiconductor layer are stacked in this order on a substrate;

15 the semiconductor laser comprising an intermediate layer sandwiched between the active layer and the p-type semiconductor layer and composed of a gallium nitride-based compound semiconductor;

the intermediate layer having a stacked structure 20 comprising an undoped layer including no intentionally added impurities and a diffusion-blocking layer doped with an n-type impurity; and the diffusion-blocking layer being located at a side adjacent to the p-type semiconductor layer.

25 7. A semiconductor laser according to claim 6,

wherein the concentration of the n-type impurity in the diffusion-blocking layer is about the same or higher than that of the p-type impurity in the p-type semiconductor layer.

5 8. A semiconductor laser according to claim 6,
wherein the concentration of the n-type impurity in the diffusion-blocking layer is not less than $1E19\text{ cm}^{-3}$ and not more than $6E19\text{ cm}^{-3}$.

9. A semiconductor laser according to claim 8,
10 wherein the semiconductor laser is a Group III-V nitride semiconductor laser, the n-type semiconductor layer contains Si as an n-type impurity, and the p-type semiconductor layer contains Mg as a p-type impurity.

10. A semiconductor laser according to claim 6,
15 wherein, assuming that the thickness of the undoped layer is 1, the thickness of the diffusion-blocking layer is not less than $1/11$ and not more than 11.

11. A semiconductor laser according to claim 10,
wherein the thickness of the intermediate layer is not
20 less than 15 nm and not more than 180 nm.

12. A semiconductor laser according to claim 6,
wherein the active layer comprises a well layer composed of InGaN.

13. A process for manufacturing a semiconductor
25 laser, comprising the steps of:

forming on a substrate an n-type semiconductor layer doped with an n-type impurity;

forming on the n-type semiconductor layer an active layer comprising a well layer composed of InGaN;

5 forming on the active layer an intermediate layer composed of a gallium nitride-based compound; and

forming on the intermediate layer a p-type semiconductor layer doped with a p-type impurity, wherein the step of forming the intermediate layer comprises the steps of growing a gallium nitride-based compound semiconductor layer without adding any impurities, thereby forming an undoped layer including no intentionally added impurities, and starting to add an n-type impurity in the course of the growth of the gallium 10 15 nitride-based compound semiconductor layer, thereby forming a diffusion-blocking layer.

14. A process for manufacturing the semiconductor laser according to claim 13, wherein the step of forming the n-type semiconductor layer on the substrate is performed after selectively growing a nitride-based compound semiconductor layer in the lateral direction on the substrate.